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Tert-butyl chloride as a probe of the solvophobic effects

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Abstract

© 2014 Elsevier B.V. Relationships between the Gibbs free energy and enthalpy of solvation of tert-butyl chloride in various protic solvents are considered in order to compare the strength of the solvophobic effects from solvent to solvent. The values of thermodynamic functions of solvation are determined experimentally using titration calorimetry and gas chromatographic headspace analysis techniques. Positions of the data points on the δG vs δH plot indicate that the solvophobic effects take place in various mono- and dihydric alcohols, acetic acid, and acid amides. The excess positive contribution into free energy of solvation of tert-butyl chloride in self-associated solvents is used to characterize their strength quantitatively. It is shown that the solvophobic effects are stronger when the concentration of the hydrogen bonds in a solvent is larger.

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Keywords

Calorimetry, Enthalpy of solvation, Gibbs free energy of solvation, Hydrogen-bonded liquids, Solvophobic effect, Tert-butyl chloride